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tion (since 1769)—as in any way giving us a rule respecting the question of increase in the deltas of rivers under ordinary circumstances. Looking at it in that point of view, therefore, the impression which has been left on my own mind is this:—that, either the maps that give us the coast-line in the year 1769, as exhibited by that dotted line, are exceedingly faulty, or that, if that really were the line of coast at that period, it must have been owing to some abnormal state of things; and that, owing to a change of currents, or to earthquakes, or to other causes, into which we are not at present capable of entering, the line of coast was not then in its normal state; and that subsequently it has returned to that which may be considered its normal state. This may be the result of two causes: first, the matter brought down by the Danube; secondly, the prevailing winds of the Black Sea, which during the summer are from the eastward, and would, therefore, tend to collect a great amount of matter along that coast during a given period. I think that the increment given during this period of 80 or 90 years is somewhere about 18 or 20 miles. If we look at the increase of the deltas of other great rivers—such, for instance, as the Ganges, the Mississippi, and rivers of that class—we find that the increase here stated is altogether out of proportion to anything we are acquainted with in those rivers; so much so, indeed, that I can only look upon it as altogether erroneous. I dare say that those gentlemen who are acquainted with the old writers will recollect the oracular verses quoted by Strabo with respect to the Pyramus, one of the rivers in Asia Minor, which brought down such an enormous quantity of sand and mud that its delta was expected to increase to an enormous extent:—

Ἔσεται λοιομένοις ὅτε Πύραμος ἐμπροσθίης
Ἡδὲνα προχέων ἱερὴν εἰς Κύπρον ἵκηται.

The meaning of which was, that a time should come in future generations when the delta of the Pyramus should be increased to so large an extent by the mud brought down from the interior, that it should stretch along the sacred land of Cyprus. Now we know that the delta of the Pyramus has not increased one mile since that was written. Therefore, I must warn those who have heard this paper read against looking upon this increment as anything like the normal state of increment which is to be expected as resulting from the matter brought down by any of the great rivers of the globe during the period that has been referred to.

The Second Paper read was:—

2. *Observations on the Geography of Central Africa.* By JAMES MACQUEEN, Esq., F.R.G.S.

MR. MACQUEEN cites in his paper the authorities that exist on the subject of the Upper White Nile, and on Kilimandjaro, with a view of proving that the latter mountain is undoubtedly snow-covered; and that, on the other hand, it has no connection with the river. He repeats the well-known description of Rebmann, who, during a period of two months that he spent in its neighbourhood, saw Kilimandjaro every day that it was clear, and even passed some time within five or six miles of the snow-covered part; and who, in further corroboration of the existence of snow, mentions how the

natives described the melting of the white material before the fire, &c., &c. Krapf, who also saw the snow, speaks of the river issuing from it as running to the eastward: he also gives the report of a large river lying far to the N. W. of the mountain, and presumed to be the Nile.

Turning to the White Nile, we have the accounts of the two Egyptian expeditions, the first of which appears to Mr. Macqueen to give the most reliable latitudes: it reached $3^{\circ} 30' N.$ lat. and $31^{\circ} E.$ long. from Greenwich, where it was stopped for want of water on Jan. 26, 1840. At that time the breadth was 1370 feet, and the greatest depth from 3 feet to 6 feet. Here the country had begun to be rocky, and the vegetation to be European in its character. Werne's information of the second Egyptian expedition is sufficiently corroborative. Dr. Knoblicher finds the river at Loquek to be 650 feet broad in the dry season, and from 5 to 8 feet deep. From Loquek to the farthest known point, that of Don Angelo is the best account: he was there in 1852. He describes the cataract of Garbo in presumably N. lat. $2^{\circ} 40'$. Sixty miles beyond this is Robingo, and then Lokoya, where an affluent runs in from the east. Beyond Lokoya the White Nile is a small rocky river.

The reports collected by travellers, such as Bruce and Harris, are then discussed, and afterwards those of Ptolemy. The paper concludes with the following account of the recent statements of M. Leon:—

“Some very curious and important information connected with the countries near the sources of the Nile has just been received from a French missionary (Père B. P. Leon), dated at Zanzibar, August, last year. This missionary had been in Enerea. He states that there is a frequented road from Brava on the sea-coast to Kaffa, the journey occupying 24 days. This, by mature estimation, is about 15 miles daily, but they never actually travel more than 10 miles on an average. The estimated distance is 360 geographical miles, which is tolerably accurate. Twelve days' journey south of Kaffa, he states, dwell a people called Amara, nearly white: they have written books, and a language different from either the Ethiopic or Arabic. They build houses and villages, and cultivate the ground. They are rightly conjectured to be the remains of Christian nations which in early times spread far to the south of Abyssinia, till they were overrun, massacred or scattered, by the savage Galla. It has been repeatedly asserted that such remnants of Eastern Christian Churches were scattered over this portion of Africa. Four days' journey from the Amara M. Leon says there is a lake, from which an affluent of the White Nile is seen to flow. M. Leon supposes

this to be the source of the Sabact, but it is more probable that it is the main stream of the Nile.

The Amara, he says, dwell between 2° and 3° N. lat., and have some tribes of copper-coloured people, who dwell near the equator, subject to them. No Mussulman can venture to enter this country."

The PRESIDENT introduced Captain Speke to the Meeting, and explained that he had within the last two days only returned from the place to which Mr. Macqueen's paper more particularly had reference; and could therefore supply some useful information.

CAPTAIN SPEKE, F.R.G.S., said: After arriving at Zanzibar, we had to wait a considerable time, some months, until the masika, or rainy season, would be over, before we could penetrate into the interior. It was generally advised that we should do so. During the interim Captain Burton and myself made a short coast tour, first to Mombas, and then proceeded down the coast to Pangani. Leaving that place, we ascended the Pangani river, and arrived at Chongwe, a small military station belonging to Prince Majid. Here we were supplied with a small escort of Belooch soldiers, who accompanied us across some hills, by an upper route, to Fuga, the capital of Usambara, where we were hospitably entertained by King Kimwere, a great despot reigning there. After visiting him for one day, the shortness of our supplies compelled us to retrace our steps by a forced and rapid march, following down close along the banks of the same river until we again arrived at Pangani. Thus ended our initiatory tour in Eastern Africa. The rainy season or masika was spent by us at Zanzibar, in constructing the equipment of a caravan. There is a singular tribe of negroes in the interior of Africa, called Wanyamuezi—the literal translation of which signifies people of the moon. These strange people are professionally voluntary porters: they annually bring down ivory to the coast in barter for themselves, or otherwise for the Arabs. At the close of the rainy season Captain Burton and myself left Zanzibar, with a caravan mustering about eighty men; having previously sent on some supplies in anticipation of our arrival. Unable to collect a sufficient caravan for the conveyance of our kit, we purchased a number of donkeys (about thirty). Thus completed, and with an escort of twelve Belooch soldiers, given us by Prince Majid, we commenced our journey westward, and arrived (by slow degrees travelling over a low alluvial plain, up the course of the Kingani river) at Zungomero, a village situated under the coast range, which struck us as bearing a good comparison with the western ghauts of India. We might call this range the Eastern Ghauts of Africa. There we were detained by severe illness a considerable time. Afterwards we crossed these eastern ghauts, the maximum altitude of which I ascertained to be about 6000 feet. On the western side of this longitudinal chain of hills we alighted on an elevated plateau, an almost dead flat, ranging in level from 3000 to 4000 feet above the sea. Here we had cold easterly winds, continuing through the entire year. Proceeding onwards, we arrived at the Tanganyika Lake, called by the Arabs Sea Ujiji, a local name taken from the country on the eastern margin of the lake, whither they go to traffic for ivory and slaves. This lake is in a singular synclinal depression; I found its elevation to be only 1800 feet; whereas the surrounding country (the plateau), as I said before, averaged from 3000 to 4000 feet. The lake is encircled at its northern extremity by a half-moon shaped range of hills, the height of which I estimated (for I could not reach its summit) to be at least 6000 feet. They may extend to a height much greater than that; however, we could not take any observations for determining it. After exploring this lake we returned by the former route to Unyanyembe, an Arab depôt, situated in latitude 5° south, and about 33°

east longitude. My companion, Captain Burton, unable to proceed farther, remained here; whilst I, taking just sufficient provisions for a period of six weeks, made a rapid march due north, to latitude $2^{\circ} 30'$ south; and there discovered the southern extremity of the Nyanza, a Lake, called by the Arabs Ukerewe, a local name for an island on it, to which the merchants go in quest of ivory. The altitude of this Lake is equal to the general plateau (4000 feet), even more than the average height of all the plateau land we traversed. In reverting to the question asked, why I consider the Lake Nyanza to be the great reservoir to the Nile, my answer is this: I find, by observation, that its southern extremity lies in east longitude 33° , and south latitude $2^{\circ} 30'$. By Arab information, in which I place implicit confidence, I have heard that the waters extend thence, in a northerly direction, certainly from five to six degrees. Notwithstanding they can account for a continuous line of water to this extent, no one ever heard of any limit or boundary to the northern end of the Lake. A respectable Sowahili merchant assured me that, when engaged in traffic some years previously to the northward of the Line and the westward of this lake, he had heard it commonly reported that large vessels frequented the northern extremity of these waters, in which the officers engaged in navigating them used sextants and kept a log, precisely similar to what is found in vessels on the Ocean. Query, Could this be in allusion to the expedition sent by Mahamad Ali up the Nile in former years? Concerning the rains which flood the Nile, the argument is simple, as I have said before: a group of mountains overhang the northern bed of the Tanganyika Lake. The Arabs assure us that from the north and north-eastern slopes of these hills during the rainy season immense volumes of water pour down in a north-easterly direction, traversing a flat marshy land, intersected by some very large, and many (they say 180) smaller streams. Again, on the western side, we hear from Dr. Krapf, that the snow-clad mountain, Kœnia, is drained by rivers on its western slopes in a direction tending to my Lake.

During the rainy season, which I know, by inspection, commences in that region on the 15th of November, and ends on the 15th of May, the down-pour is pretty continuous. Super-saturation, I should imagine, takes place later on the northern than on the southern side of the aforesaid moon-shaped mountain, systematically in accordance to the ratio of seasonal progression; but this, in so mean a distance, could not be very great. Suffice it to say, that I saw the Malagarazi river, which emanates from near the axis of these hills, to be in a highly flooded state on the 5th of June. The Nile at Cairo regularly swells on the 18th of June.

Farther, it would be highly erroneous to suppose that the Nile could have any great fluctuations from any other source than periodical rains. Were the Nile supplied by snow, as some theorists suppose, its perennial volume would ever be the same. There would be no material fluctuations observable in it, in consequence of its constant and near approximation to the path of the sun.

By these discoveries, the old and erroneous hypothesis of a high latitudinal range of mountains extending across the continent of Africa from east to west, in the vicinity of the Line, and known as the Mountains of the Moon, is therefore now annihilated. However, it is worthy of remark, that the crescent-shaped mountain, which we visited to the northward of the Tanganyika, lies in the centre of the continent of Africa, immediately due west of the snowy peaks Kilimanjaro and Kœnia, and is west beyond the Unyamuezi, or Country of the Moon. The Wanyamuezi tribe has from time immemorial been addicted to journeying, and at all periods has constantly visited the eastern coast of Africa. It would not be beyond legitimate and logical supposition, to imagine that these hills, lying beyond their Moon Country, should have given rise to the term Mountains of the Moon, and from misunderstanding their relative position with the snowy Kœnia and Kilimanjaro, should

have been the means of misguiding all ancient inquirers about that mysterious mountain.

My positions were fixed by astronomical observations, certainly under painful and considerable difficulties, owing to my constantly impaired general state of health: weakness and blindness not being the least of these difficulties which I had to contend with. My latitudes were taken by the altitude of stars, at nearly every stage, on an average from ten to fifteen miles apart. I also fixed some crucial stations, the principal points for delineating the country by lunars, on which I place great reliance, as the means of the masses of them which I took show so little deviation. The intermediate distances I compassed very closely; the altitudes of the country I traversed I determined by boiling thermometer; on which I also place very great reliance. We had a thermometer and pedometer, and several chronometers. The performance of these instruments was anything but satisfactory: indeed, finally, I had to rig up a string and bullet pendulum to beat time whilst taking my lunars in the latter stage of the journey. There now can be no doubt that this great lake, the Nyanza (Captain Speke now pointing to the map), is the great reservoir of the Nile, and that its waters indubitably extend northwards from the position visited by me on its southern extremity to $3\frac{1}{2}^{\circ}$ north-latitude, lying across the equator, and washes out that supposed line of mountains, called the Mountains of the Moon, which stands so conspicuously in all our atlases.

The PRESIDENT (to Mr. Macqueen).—In short he carries his lake through your mountains.

DR. BIGSBY, F.R.G.S., desired some farther information concerning the people, their civility, numbers, and mode of subsistence.

The PRESIDENT thought such matter foreign to the subject of the paper.

MR. MACQUEEN, F.R.G.S., said the question of the sources of the Nile had cost him much trouble and research, and he was sure there was no material error either in longitude or latitude in the position he had ascribed to them, namely, a little to the eastward of the meridian of 35° , and a little northward of the equator. That was the principal source of the White Nile. The mountains there were exceedingly high, from the equator north to Kaffa Cnarea. All the authorities, from east, west, north, or south, now perfectly competent to form judgments upon such a matter, agreed with him; and among them were the officers commanding the Egyptian commission. It was impossible they could all be mistaken. Dr. Krapf had been within a very short distance of it; he was more than 180 miles from Mombas, and he saw snow upon the mountains. He conversed with the people who came from them, and who told him of the snow and exceeding coldness of the temperature. The line of perpetual congelation, it was well known, was 17,000 feet above the sea. He had an account of the navigation of the White Nile by the Egyptian expedition. It was then given as $3^{\circ} 30'$ N. lat. and 31° S. lat. At this point the expedition turned back for want of a sufficient depth of water. Here the river was 1370 feet broad, and the velocity of the current *one-quarter* of a mile per hour. The journals also gave a specific and daily current, the depth and width of the river, and everything, indeed, connected with it. Surely, looking at the current of the river, the height of the Cartoom above the level of the sea, and the distance thence up to the equator, the sources of the Nile must be 6000 or 8000 feet above the level of the sea, and still much below the line of the snow, which was 6000 or 8000 feet farther above them. He deeply regretted he was unable to complete the diagram for the rest of the papers he had given to the Society, for it was more important than any others he had previously given. It contained the journey over Africa from sea to sea, second only to that of Dr. Livingstone. But all the rivers coming down from the mountains in question, and running south east-

ward, had been clearly stated by Dr. Krapf, who gave every particular concerning them. He should like to know what the natives had said was to the northward of the large lake; did they say the rivers ran out from or into the lake? How could the Egyptian officers be mistaken?

CAPTAIN SPEKE replied. They were not mistaken; and if they had pursued their journey 50 miles farther, they would undoubtedly have found themselves at the northern borders of this lake.

MR. MACQUEEN said that other travellers, Don Angelo for instance, had been within one and a half degree of the Equator, and saw the mountain of Kimborat under the Line, and persisted in the statement, adding, that travellers had been up the river until they found it a mere brook. He felt convinced that the large lake alluded to by Captain Speke was not the source of the Nile: it was impossible it could be so, for it was not at a sufficiently high altitude.

The paper presented to the Society, when fully read in conjunction with the map, will clearly show that the Bahr-el-Abred has no connection with Kilimanjaro, that it has no connection whatever with any lake or river to the south of the Equator, and that the swelling of the river Nile proceeds from the tropical rains of the northern torrid zone, as was stated emphatically to Julius Caesar by the chief Egyptian priest Amoreis 2000 years ago.

In nearly 3° N. lat. there is a great cataract, which boats cannot pass. It is called Gherba. About half-way (50 miles) above, and between this cataract and Robego, the capital of Kuenda, the river becomes so narrow as to be crossed by a bridge formed by a tree thrown across it. Above Gherba no stream joins the river either from the south or south-west.

COLONEL SYKES, F.R.G.S., thought the difficulties raised by Mr. Macqueen quite reconcileable with the facts stated by Captain Speke, as resulting from his and Captain Burton's explorations, for every great river had more than one source. He illustrated his observation by a practical reference to the human hand and arm; supposing the latter to be the main stream, the fingers might form the sources, all converging at the wrist to one great whole. The only question, therefore, was, which of those branches should be considered the chief source of the river? But each might be equal in size and of equal distance from the point of junction. The fact was, they were all sources. Captain Speke described a range of mountains running, not from east to west, but from north to south across the Equator. This range had necessarily a double watershed to the east and to the west. The rivers observed by Krapf and Rebmann ran down to the eastward, but other rivers (describing them on the map) ran down to the westward. Consequently there were two directions in which the waters run from exactly the same locality. What, therefore, could be more reasonable than to suppose that the water parting to the westward should run into the lake mentioned by Captain Speke? And as this lake was at an elevation of 4000 feet above the sea, and the depression of the country was from the lake towards the north generally, as indicated by the course of the Nile, which had been traced up to within 3½° of the Equator, it is more than probable that the lake was one of the chief sources of the Nile, and that other neighbouring sources would be found in the snow-peaks of Kilimanjaro and Kaenia, forming parts of the range of mountains spoken of by Captain Speke. Mr. Macqueen spoke of the improbability of there being snow-capped mountains upon the Equator, as their elevation must necessarily be above 17,000 feet; but we are not justified in impugning the accuracy of the statements of Krapf and Rebmann. Under religious impulses, their vocation as missionaries was the promulgation of truth, and we cannot suppose them capable of inventions for which there was not any motive.

The origin of Pliny's associating the source of the Nile with the Mountains of the Moon, would seem to find an explanation in the name of the

nation or tribe living in the neighbourhood of the lake being the same with that of the moon: mistakes in modern times are traceable to associations much weaker than this.

But a full discussion of Captains Burton and Speke's labours must be reserved for a future occasion; meanwhile we are satisfied that important geographical discoveries have been made.

MR. MACQUEEN said that if the Nile or its sources were to the south of the Equator, it would not fall where the Egyptian expedition had left it, viz. at $3^{\circ} 30'$ north on the 26th of January, but it then fell so fast that the expedition did not proceed. As a proof that the Nile did not rise to the south of the Equator, it was only necessary to mention the fact that the rains on the south of the Line commenced in December and in January and February, and became very strong; the river would be flooded, therefore, in January, in place of falling: this he thought settled the point beyond question. He admitted the Nile must have more sources than one, but not one of them went so far south; if it did, the principal branch would have certainly been flooded in January, whereas in that month it fell: but at the end of March, exactly as the sun came back towards the Equator and the rains fell to the north, it would rise again.

COLONEL SYKES observed that tropical rains north of the Equator commenced in June.

MR. MACQUEEN said he had been speaking of the south.

CAPTAIN SPEKE obtained his information of the countries tending northwards, along the western borders of the Lake, from highly intelligent Arab merchants, from whom he had previously received some excellent and trustworthy information, and he felt he might rely on what they had stated, in regard to the ground under dispute, more especially as it corroborated his own observations made on the Malagarazi River.
